BOOKS: MOLECULAR BIOLOGY

Information Isn't Everything

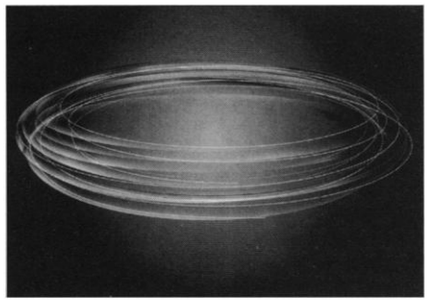
Louis J. DeFelice

Over 30 years ago, the research of Werner Loewenstein and his colleagues on cell junctions opened the field of intercellular communication. Since then, Loewenstein has contributed much to our understanding of biological information transfer. His new book, *The Touchstone of Life*, is in many ways highly original; it is also often disappointing. In it, he argues that "information flow, not energy per se, is the prime mover of life."

The Touchstone of Life
Molecular Information, Cell Communication, and the Foundations of Life
by Werner R. Loewenstein
Oxford University Press, New York, 1999. 384 pp. $30. ISBN 0-19-511828-6.

The first section of the book leads us from the secular terrain of information theory to the mystical gates of the Garden of Eden. Loewenstein thus begins with no less a topic than the origin of life. He approaches this resoundingly biological theme from the standpoint of theoretical physics and then ties it to information with the ubiquitous entropy. Stepping back to look, literally and figuratively, at the big picture, Loewenstein considers the cosmic origin of information and the consolidation of information in physical objects on Earth. Sub-headings such as "The New Alchemy" and "The Proteus Stuff" will intrigue the erudite reader. Maxwell's demons, illusory creatures who can sort energy, are constant companions on this empyrean walk. They enter into virtually every argument and set the margins for Loewenstein's organizational fabric of biological molecules.

In Part Two, our expedition tramps to the interior of cells; we are still on the trail of information but now tracking errors in DNA molecules. Quantum chemistry, Loewenstein asserts, is no match for the grand design of the biological code, the "spooling of the golden thread" that can weave information into nets as well as yard goods. Readers familiar with Richard Powers's allegory, *The Gold Bug Variations*, will recognize themes in Loewenstein's metaphor of "the mountain and Mahomet," which the author uses to decorate the theory of how proteins read the genetic code.



"The Circus. Flowing in from the cosmos, information loops back onto itself to produce the circular information complex we call Life."

CREDIT: FIGURE 6.4/*THE TOUCHSTONE OF LIFE*

Fully halfway into the book, we arrive at the dominion where Loewenstein is monarch: "Information Flow Between Cells." But the topic of intercellular communication, easily Loewenstein's strong point, is unfortunately shrouded in obscurity. We begin to tire of similes and folk tales, and we yearn for more solid ground to stand upon. Cell membranes and cell-to-cell channels are topics that Loewenstein is rightfully identified with, yet the reader is stupefied by a plethora of demons and a profusion of analogies. Confusion is the likely result of the mislabeled "syncretic communication," which in Loewenstein's context refers to the union of like, not unlike, entities. I cannot think that "cellcosm" is a word worth coining, or that "Parlez vous Cellulaise?" is a subtitle that achieves the author's purpose. As a further frustration, Loewenstein is not only capable of but quite masterful at explaining science to the general reader; his skill is exemplified by the straightforward discussion under the upright title, "What is Cancer?"

Part Four is, happily, brief. We read that Epicurus was probably right in his pronouncement that all philosophy takes its origins from wondering. I wonder why Loewenstein falls into clichés about Occam's razor after so much hard work, or why Darwin barely appears in this summary—or, indeed, in the entire text. Is the machinery of Darwinism not the topic we are pondering? Such neglect is commonplace, as in Murray Gell-Man's pretentious book *The Quark and the Jaguar*. When physicists discourse on biological themes they may be forgiven for disregarding prominent theories of evolution, but when Loewenstein makes this blunder it is puzzling.

Loewenstein's book is not the place to learn physics, any more than Gell-Mann's book is the place to learn biology. Not that biology and physics are inexorably separate, only that neither author succeeds in the hoped-for synthesis, and neither tells us much about their actual topic, Darwinism. For possible mechanisms of Darwinian evolution, readers should look instead to the scholarly works of Ernst Mayr, such as his brilliant and comprehensive *Toward a New Philosophy of Biology*.

In fairness it should be said that this review is more about style than content, for *The Touchstone of Life* contains myriad facts, unexpected relations, and remarkable insights, albeit hidden in arcane embellishment. At the beginning of his tome Loewenstein touchingly acknowledges his colleagues and friends for what is by any measure a successful scientific and personal life. That was my favorite section of the book.

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BOOKS: BIOCHEMISTRY

Free Radicals in the 20th Century

Ian A. Cotgreave and Sten Orrenius

As a new millennium of scientific endeavor rapidly approaches, we are beginning to develop a more holistic vision of biochemical and genetic events in biological systems. This challenges us in terms of technical requirements for research, the interpretation of data, and predictions of the way forward. These quandaries are particularly apparent to researchers studying redox reactions and oxidative stress in biological systems.

Reactive Oxygen Species in Biological Systems
An Interdisciplinary Approach
Daniel L. Gilbert and Carol A. Colton, Eds.
Kluwer/Plenum, New York, 1999. 733 pp. $165, £97.50. ISBN 0-306-45756-3.

Interest in this area is growing extremely rapidly. A cursory perusal of Medline found 177 citations containing the words "reactive oxygen species" or "oxidative stress" over the interval 1976 to 1984. For 1991 through

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